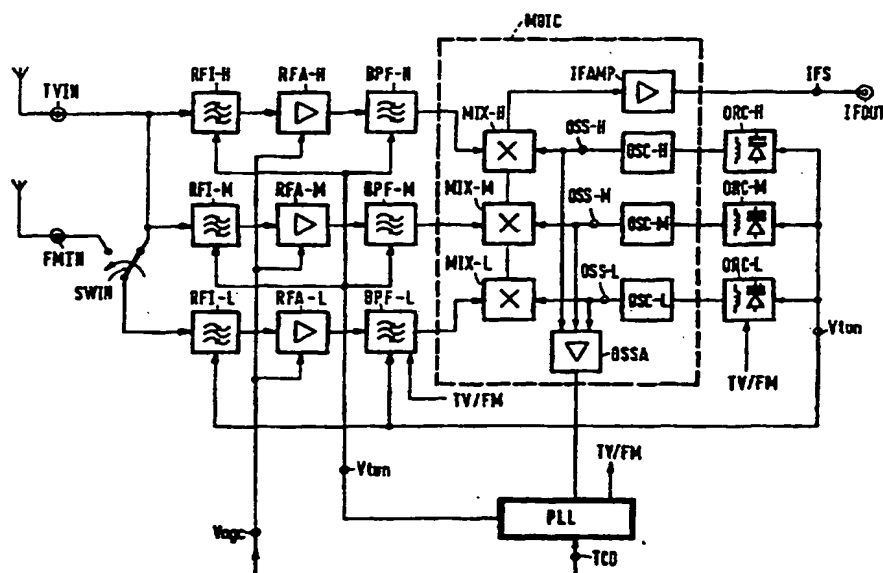




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04B 1/16		A2	(11) International Publication Number: WO 97/25781
			(43) International Publication Date: 17 July 1997 (17.07.97)
(21) International Application Number: PCT/IB96/01412		(81) Designated States: CN, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 11 December 1996 (11.12.96)			
(30) Priority Data: 9600124-3 10 January 1996 (10.01.96) SG		Published Without international search report and to be republished upon receipt of that report.	
(71) Applicant: PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).			
(71) Applicant (for SE only): PHILIPS NORDEN AB [SE/SE]; Kottbygatan 7, Kista, S-164 85 Stockholm (SE).			
(72) Inventor: BREKELMANS, Johannes, Hubertus, Antonius; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).			
(74) Agent: KOOIMAN, Josephus, J., A.; Internationaal Octrooibureau B.V., P.O. Box 220, NL-5600 AE Eindhoven (NL).			

(54) Title: TV/FM RECEIVER FOR MULTIMEDIA APPLICATIONS



(57) Abstract

A receiver for receiving reception signals of a first type, for example TV signals, and reception signals of a second type, for example FM-radio signals, is described. The receiver may be used in multimedia applications. In the receiver, an input section TVIN, FMIN, SWIN comprises at least two inputs TVIN, FMIN to which reception signals can be applied. One input TVIN may, for example, be coupled to a cable network via which reception signals are distributed. The other input FMIN may, for example, be used to plug-in a simple wire antenna. In many cases such a wire antenna will be sufficient to receive on-air reception signals with acceptable quality. The invention takes into consideration that on-air reception signals may not always be offered by the cable network. With at least two inputs TVIN, FMIN, there is flexibility of reception.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

TV/FM receiver for multimedia applications.

The invention relates to a receiver for receiving reception signals of a first type, for example TV signals, and reception signals of a second type, for example FM-radio signals. The invention also relates to a multi-media apparatus incorporating such a receiver. The receiver may enhance the functionality of the multi-media apparatus with for example, TV and FM-radio reception. The multimedia apparatus may be in the form of a personal computer (PC) having slots in which add-on cards are plugged. The receiver may be implemented on one of these add-on cards. Accordingly, the PC can access information transmitted by FM-radio and TV stations.

10

A receiver capable of receiving TV and FM-radio signals is described in US-A 5,148,420. In the prior-art receiver, both TV and FM-radio signals are supplied to a single tuner via a common RF input. The single tuner converts a particular reception signal to a fixed intermediate frequency (IF) of approximately 40 MHz, which is common for TV reception. The IF signal produced by the tuner is processed differently for TV or FM-radio reception. For TV reception, the IF signal is processed in a manner which is very similar to IF signal processing in most present-day receivers. For FM-radio reception, the IF signal is supplied to a single chip FM-radio integrated circuit (IC) via a filter unit. In the FM-radio IC, the IF signal is frequency-converted to obtain a nominal 10.7 MHz FM IF signal, which is further processed in a common manner.

15
20

Although the prior-art receiver is capable of retrieving information from both TV and FM-radio signals received at the common RF input, the prior-art receiver has a relatively low flexibility.

25

It is an object of the invention to provide a receiver which is more flexible in retrieving information than the above described prior-art receiver.

According to one aspect of the invention, there is provided a receiver as defined in Claim 1.

30

According to another aspect of the invention, a multimedia apparatus

comprises such a receiver.

Yet another aspect of the invention provides a tuner as defined in Claim

4.

The invention may be used in the reception of both TV and FM-radio
5 signals. In an example of such a use, a tuner for receiving both TV and FM-radio signals has
an input section which comprises two inputs to which reception signals can be applied. One
input may, for example, be coupled to a cable network via which reception signals are
distributed. The other input may, for example, be used to plug-in a simple wire antenna. In
many cases, such a wire antenna will be sufficient to receive local stations with an acceptable
10 quality. The invention takes into consideration that local stations, or any other on-air
reception signal, may not always be offered by the cable network.

The invention is particularly suited for multi-media applications. As
indicated in the opening paragraph, a receiver in accordance with the invention may be
implemented on an add-on card. The flexibility offered by the invention may further enhance
15 the functionality of the add-on card, so that makes that the add-on card can be used in a great
variety of multimedia applications.

Advantageously, the input section comprises a switch for effectively
decoupling at least one of the two inputs from the tuner. This embodiment of the invention
takes into consideration that user-made wire antennas have an undefined impedance. The
20 undefined impedance at the wire antenna input may affect reception of cable network signals
received via the other input. The switch can insulate the undefined impedance from the tuner.

Advantageously, a multi-band tuner is used for processing a reception
signal in one of a plurality of branches depending on the frequency of the reception signal,
and the switch is coupled to an input of one branch. Accordingly, reception signals which are
25 processed in the other branches effectively by-pass the switch. This embodiment of the
invention takes into consideration that, in practice, most switches have non-linearities to
some extent. Such non-linearities may impair the reception quality, for example, by causing
intermodulation.

The invention will hereinafter be described in greater detail with reference
30 to examples shown in the drawings. Furthermore, advantageous implementation details,
which are defined in the dependent Claims, will also be described with reference to the
examples shown.

In the drawings:

Fig. 1 shows an example of a tuner in accordance with the invention in the form of a block diagram;

Fig. 2 shows, in a circuit diagram form, an example of a switchable input section for conveying signals to various branches in the Fig. 1 tuner;

Fig. 3 shows, in a circuit diagram form, an example of a preferred switchable input section for conveying signals to various branches in the Fig. 1 tuner; and

Fig. 4 shows, in an abstract diagram form, an example of a multimedia apparatus comprising the Fig. 1 tuner.

Like elements have like reference signs throughout the drawings.

The invention will be described by way of example with reference to the Fig. 1 tuner which can receive both TV and FM-radio signals. In that respect, implementation aspects of the Fig. 1 tuner will also be discussed with reference to Figs. 2 and 3, and an example of a multi-media application of the Fig. 1 tuner will be discussed with reference to Fig. 4. Finally, some remarks are made so as to indicate that the scope of the invention claimed is well beyond the examples shown in the Figures.

Referring to the Fig. 1 tuner, TV and FM-radio signals may be applied at inputs TVIN and FMIN, respectively. The Fig. 1 tuner receives tuning control data TCD relating to a desired reception signal, for example the frequency and the type of signal: TV or FM. In response to the desired reception signal, the Fig. 1 tuner provides an intermediate frequency signal IFS at an output IFOUT.

The Fig. 1 tuner can operate in two modes: a TV-mode if the desired reception signal is a TV signal, or an FM-mode if the desired reception signal is an FM-radio signal. In the TV-mode, the intermediate frequency signal IFS is at an intermediate frequency of 38,9 MHz, hereinafter abbreviated to TV-IF. In the FM-mode, the intermediate frequency signal IFS is at an intermediate frequency of 10.7 MHz, hereinafter abbreviated to FM-IF.

The Fig. 1 tuner is based on a so-called three-band concept. This means that the Fig. 1 tuner comprises three separate branches for processing the TV signals in three respective frequency bands: high-band, medium-band and low-band. Each branch comprises the following parts: an input filter RFI-H/-M/-L, an input amplifier RFA-H/-M/-L, a band-pass filter BPF-H/-M/-L, a mixer MIX-H/-M/-L, an oscillator circuit OSC-H/-M/-L

and an oscillator resonant circuit ORC-H/-M/-L. The suffixes -H, -M and -L used in the reference signs for these parts indicate whether a relevant part belongs to the high, medium or low-band branch. The Fig. 1 tuner may be implemented by using a mixer-oscillator integrated circuit MOIC, for example of the type TDA 5736 manufactured by Philips Semiconductors, which comprises the parts present within the dotted rectangle designated MOIC in Fig. 1.

In the Fig. 1 tuner, FM-radio signals are processed in the low-band branch. A switch SWIN couples the low-band branch either to the input TVIN or to the input FMIN. In the first case, TV signals are supplied to the low-band branch, in the other case FM-radio signals are supplied to the low-band branch. The position of the switch SWIN may depend on the mode, TV or FM, in which the Fig. 1 tuner operates. However, in some applications it may be preferable to control the switch SWIN independently of the mode. For example, FM-radio signals may be present both at the input TVIN and at the input FMIN. In that case, it may be advantageous to select the position of the switch SWIN, in the FM-mode, for best FM-radio reception. A kind of antenna diversity is provided. One antenna may be a wire antenna coupled to the input FMIN, for example, the other antenna may be a VHF/TV antenna, for example, via which FM-radio signals can also be received.

In each branch, the input filter RFI-H/-M/-L attenuates signals which are relatively distant in frequency from the desired reception signal so as, to prevent overload of the input amplifier RFA-H/-M/-L. The amplifier RFA-H/-M/-L is controlled by a gain control voltage Vagc. The band-pass filter BPF-H/-M/-L provides a further attenuation of undesired signals. The mixer MIX-H/-M/-L effects a frequency shift of the desired reception signal by multiplying the desired reception signal with an oscillator signal OSS-H/-M/-L. The oscillator signal OSS-H/-M/-L is generated by the oscillator circuit OSC-H/-M/-L and the oscillator resonant circuit ORC-H/-M/-L, which determines the frequency of the oscillator signal OSS-H/-M/-L. The mixer provides the intermediate frequency signal IFS, via an intermediate frequency amplifier IFAMP.

In each branch, a phase-locked loop circuit PLL controls the oscillator signal OSS-H/-M/-L of the relevant branch. The phase-locked loop circuit PLL derives, in a conventional manner, a tuning voltage Vtun from the tuner control data TCD and the oscillator signal OSS-H/-M/-L received via an oscillator signal amplifier OSSA. The tuning voltage Vtun is applied to the oscillator resonant circuit ORC-H/-M/-L. In the TV-mode, the oscillator signal OSS-L in the low band-branch is set to a frequency which is the sum of the desired reception signal and the TV-IF (38.9 MHz). In the FM-mode, the oscillator signal

OSS-L is set to a frequency which is the sum of the desired reception signal and the FM-IF (10.7 MHz).

In each branch, the tuning voltage V_{tun} is also used to vary the respective passbands of the input filter RFI-H/-M/-L and the bandpass filter. Preferably, the passbands should encompass the desired reception signal. If not, the desired reception signal is distorted and undesired signals may not be sufficiently attenuated. In the TV-mode, the passbands should encompass the difference of the oscillator signal frequency and the TV-IF. In the FM-mode, the passbands should be centred at the difference of the oscillator signal frequency and the FM-IF. The position of the passbands with respect to the frequency of the oscillation signal, while tuning through the reception bands, is hereinafter referred to as tracking.

The phase-locked loop circuit PLL also provides a mode-switch signal TV/FM. In the low-band branch, the mode-switch signal TV/FM is used to switch the oscillator resonant circuit ORC-L. The oscillator signal OSS-L is switched to a higher frequency in the TV-mode than in the FM-mode, for a given value of the tuning voltage V_{tun} . Respective pass-bands of the input filter RFI-L and the band-pass filter BPF-L remain substantially constant for a given value of the tuning voltage V_{tun} . Thus, the frequency offset between the input filter RFI-L and the band-pass filter BPF-L, on the one hand, and the oscillator signal OSS-L, on the other hand, is switched. The frequency offset is preferably switched to the TV-IF in the TV-mode and to the FM-IF in the FM-mode.

In addition, the mode control signal TV/FM preferably switches the passbandwidth of the bandpass filter BPF-L in the low-band branch. In the TV-mode, the bandpass filter BPF-L has a preferably relatively wide passband, for example 10 MHz, whereas in the FM-mode the passband is preferably relatively narrow, for example 1 MHz.

Fig. 2 shows, in a circuit diagram form, an example of a switchable input section for conveying signals at the inputs TVIN and FMIN to the low-band, medium-band and high-band branches in the Fig. 1 tuner. It should be noted that the switch SWIN shown in Fig. 1 is a functional representation of the Fig. 2 input section, rather than an electrical equivalent. The Fig. 2 input section not only provides switching, but also includes circuitry for suitably routing high-band, mid-band and low-band TV signals from the input TVIN to the relevant branches.

The Fig. 2 input section is based on a prior-art TV-RF input circuit which is described in US-A 4,851,796, herein incorporated by reference herein. Elements in Fig. 2 which correspond to the prior-art TV-RF input circuit are the following: an image trap 10, inductances L1, L2 and L3, and a capacitor C. In Fig. 2, the reference signs of the afore-

mentioned elements are identical to reference signs of corresponding elements in the Figure of US-A 4,851,796 which shows the prior-art TV-RF input circuit.

In accordance with the present example of the invention, the Fig. 2 input section comprises four switching diodes D1, D2, D3 and D4, respectively. In the FM-mode, switching diodes D2 and D4 are conducting, while switching diodes D1 and D3 are both non-conducting. In the TV-mode, the switching diodes D1 and D3 are conducting, while the switching diodes D2 and D4 are non-conducting. The four switching diodes D1, D2, D3 and D4 may be controlled by the mode control signal TV/FM, present in the Fig. 1 tuner, in a common manner. However, in some applications it may be preferable to control the switch SWIN independently of the mode, TV or FM, in which the tuner operates. Accordingly, in these applications a separate control signal will be used for controlling the switch SWIN.

In the Fig. 2 input section, in the TV-mode, the switching diode D1 effectively short-circuits the input FMIN to which FM-radio signals are applied. This promotes the reception quality of high-band TV signals in particular, which can be explained as follows.

The source connected to the input FMIN may not have a well-defined impedance. For example, it is very well possible that a user just connects a piece of wire, as this will often be sufficient to receive local FM-radio stations with sufficient quality. The impedance of such a wire-antenna is quite undefined and, moreover, the impedance may vary considerably over the TV frequency range from, say, 48 to 855 MHz. If the input FMIN is not sufficiently isolated from the TV-RF input circuit, this may affect the power matching between the source connected to the input TVIN and the relevant input filter RFI-H/-M/-L.

In the TV-mode, the switching diodes D2 and D4 provide isolation. However, in the TV-mode, the switching diodes D2 and D4 are reverse biased and have parasitic capacitances. As a result, the isolation becomes weaker and weaker with increasing frequency. Depending on, for example, the wire-antenna connected to the input FMIN, it may happen that an insufficient amount of TV signal power is transferred to the relevant input filter. Especially the high-band TV signals may be affected in that sense. The above described problem is solved by effectively short-circuiting the input FMIN in the TV-mode.

In the Fig. 2 input section, the isolation is provided, as already mentioned, by the switching diodes D2 and D4, which are arranged in a back-to-back configuration. This additional feature also promotes the reception quality of high-band signals, which can be explained as follows. In practice, the parasitic capacitance of the isolation of the input FMIN may form, in combination with a parasitic inductance of a

connection for example, a parasitic resonant circuit which causes poor matching. By halving the parasitic capacitance, for example, the parasitic resonant circuit may be de-tuned sufficiently to obtain satisfactory power matching.

The Fig. 2 input section comprises a resistance R2 in series with the
5 switching diode D3. Depending on the state of the switching diode D3, the resistance R2 affects or does not affect the characteristics of the input filter RFI-L, which is shown in detail. The input filter RFI-L is basically a parallel resonant circuit, which includes an inductance L4. In the FM-mode, the switching diode D3 is non-conducting, so that the resistance R2 is effectively isolated from the parallel resonant circuit, which has a relatively
10 high quality factor. In the TV-mode, however, the switching diode D3 conducts and the resistance R2 effectively reduces the quality factor of the parallel resonant circuit in the input filter RFI-L. This produces the advantageous effect that, in the FM-mode, the input filter RFI-L has a narrower bandwidth than in the TV-mode.

In the Fig. 2 input section, the input FMIN is coupled to switching diodes
15 D1 and D4 via an FM input filter. The FM input filter is formed by two inductances L5 and L6 and a capacitance C1. Elements in Fig. 2 which have no reference signs, are used for suitably coupling AC and/or DC signals, as those skilled in the art will immediately recognize. Consequently, these elements do not need to be further discussed in this specification.

20 Fig. 3 shows, in a circuit diagram form, a preferred input section for conveying signals at the inputs TVIN and FMIN to the low-band, medium-band and high-band branches in the Fig. 1 tuner. Like the Fig. 2 input section, the Fig. 3 input section is based on the prior-art TV-RF input circuit described in US-A 4,851,796. However, in accordance with the present example of the invention, in the Fig. 3 input section, low-band
25 TV signals at the input TVIN are routed to the low-band branch in a different manner than in the Fig. 2 input section. In the Fig. 3 input section, low-band TV signals are applied to the input filter RFI-L via the input filter RFI-H in the high-band branch.

In Fig. 3, the input filter RFI-H in the high-band branch, through which
low-band TV signals are routed, is shown in detail. The input filter RFI-L comprises an
30 inductance LH, a varicap diode CHvar and a capacitance CHpad, which constitute a parallel resonant circuit. A signal in the parallel resonant circuit is tapped off via a series arrangement of an inductance LHtap and a capacitance CHtap. The inductance LH in the input filter RFI-H should have a value which is suitable for tuning the parallel resonant circuit in the high-band. Consequently, may the LH in the low-band has a relatively small

impedance and, by way of approximation may, be seen as a short-circuit in the low-band.

The Fig. 3 input section comprises three switching diodes D1A, D2A and D3A, instead of four as in the Fig. 2 input section. When switching diode D1A is conducting, one end of the parallel resonant circuit in the input filter RFI-H is effectively coupled to ground. However, when the switching diode D1A is non-conducting, a low-band TV signal may be transferred via the input filter RFI-H to the input filter RFI-L. For such a transfer, switching diode D2A should be in a conductive state. When switched to a non-conductive state, Switching diode D3A provides a satisfactory isolation of the input FMIN from the TV-RF circuit. A switching diode for effectively short-circuiting the input FMIN, like the switching diode D1 in Fig. 2, is not present in the Fig. 3 input section.

The Fig. 3 input section can be divided into four switching states: TV-low, TV-mid, TV-high and FM. Table 1 below lists the relation between the switching state and the state of each of the three switching diodes individually. In table 1, a 0 indicates that the relevant switching diode is in a non-conductive state, and a 1 indicates that it is in a conductive state.

	D1A	D2A	D3A
TV-low	0	1	0
TV-mid	0	0	0
TV-high	1	0	0
FM	1	0	1

Table 1.

In Fig. 3, each of the three switching diodes D1A, D2A and D3A receives an individual control signal S(D1A), S(D2A) and S(D3A), respectively. The control signals may be obtained, for example, from the phase-locked loop circuit PLL via a band-switching logic circuit (not shown).

In the TV high-band switching state, any undefined impedance at the input FMIN is very well insulated from the high-band branch, because all three switching diodes D1A, D2A and D3A effectively contribute to that insulation. In the TV high-band switching state, switching diodes D2A and D3A are non-conducting and the switching diode D1A is conducting. In the FM switching state, the switching diode D3A is conducting for conveying an FM-radio signal at the input FMIN to the low-band branch. The switching diode D1A and the switching diode D2A are non-conducting to insulate the input TVIN from the low-band

branch.

In the Fig. 3 input section, an inductance L1A is coupled in series with the resistor R2, whose function was already explained with reference to Fig. 2. The inductance L1A tunes the input filter RFI-L differently in the TV-mode and in the FM-mode.

5 Referring to the Fig. 1 tuner, the difference in tuning may advantageously be used to compensate for any de-tuning of the bandpass filter BPF-L, as a result of passband switching of this filter. With an appropriate value of the inductance L1A, the passbands of the input filter RFI-L and the bandpass filter BPF-L are substantially matched.

Elements in Fig. 3 which have no reference signs, are used for suitably
10 coupling AC and/or DC signals, as those skilled in the art will immediately recognize. Consequently, these elements do not need to be further discussed in this specification.

Fig. 4 shows an example of a multimedia apparatus comprising the Fig. 1 tuner TUN. The Fig. 1 tuner TUN is implemented on an add-on card PCAO, which add-on card PCAO is plugged into an add-on card holder HOL of the multi-media apparatus. Apart
15 from the Fig. 1 tuner TUN, the add-on card includes TV IF signal processing circuitry TVIFC and FM IF signal processing circuitry FMIFC. The latter circuitries receive the intermediate frequency signal IFS provided by the Fig. 1 tuner TUN via an IF splitting filter IFSF. The Fig. 1 tuner TUN, the IF splitting filter IFSF and the TV IF signal processing circuitry TVIFC are housed in a shielded metal box SMB. The shielded metal box SMB with
20 the aforementioned parts may, as such, be manufactured as such and sold to add-on card manufacturers.

The Fig. 4 multimedia apparatus includes a user-interface UIF, a control unit CCU, a picture display device PDD, a sound reproduction unit SRU. A user selects the desired reception signal via the user-interface UIF. For example, he may enter a program
25 number on a keyboard which is part of the user-interface UIF. The control unit CCU effectively controls the add-on card PCAO in such a way that the Fig. 1 tuner TUN selects the desired reception signal. For example, the control unit CCU provides instructions which are stored in a memory (not shown) relating to the frequency of the desired reception signal and the type of signal: FM or TV. These instructions are supplied to the Fig. 1 tuner TUN
30 in the form of the tuner control data TCD. The add-on card PCAO provides sound and/or video information, for example, obtained from the desired reception signal, which information may be further processed in the control unit CCU. The sound and/or video information is provided to the user via the sound reproduction unit SRU and the picture display device PDD, respectively.

Evidently, the invention may be implemented differently from the examples described above. In that respect, any reference signs in a claim cannot be construed as limiting the claim concerned. To indicate that the scope of the invention claimed is well beyond the examples described above, some final remarks are made.

5 It should be noted that the invention is not limited to combined TV and FM-radio reception, two different types of reception signals, or two inputs, such as the inputs TVIN and FMIN. If so desired, more inputs can be used.

 Moreover, the invention is not limited to multimedia applications. The invention may be used in any apparatus comprising a receiver, such as TV receivers and
10 video-tape recorders.

 It should also be noted that the invention is not limited to a 3-band tuner concept, as shown in Fig. 1. In principle, the invention may be applied in any tuner concept, for example in a 2-band tuner concept.

 It should further be noted that the invention is not limited to the use of an
15 RF-TV input circuit as described in US-A 4,851,796.

 Finally, should be noted that a larger or smaller number of switching diodes can be used. For example, in the Fig. 2 input section, any one of the switching diodes D2 and D4 may be dispensed with. The switching diode D4 may be replaced by for example, a capacitor.

Claims:

1. A receiver for receiving reception signals of a first and a second type, the receiver comprising:
 - an input section (TVIN, FMIN, SWIN) for receiving a reception signal;
 - a tuner (TUN) for providing, in response to the reception signal, an
 - 5 intermediate frequency signal (IFS);
 - a first intermediate frequency signal processing arrangement (TVIFC) coupled to process said intermediate frequency signal (IFS) when receiving said first-type reception signals; and
 - a second intermediate frequency signal processing arrangement (FMIFC)
 - 10 coupled to process said intermediate frequency signal (IFS) when receiving said second-type reception signals,
 - characterized in that said input section (TVIN, FMIN, SWIN) comprises a plurality of inputs (TVIN, FMIN) to which the reception signal may be applied.
- 15 2. A receiver as claimed in Claim 1, characterized in that said input section (TVIN, FMIN, SWIN) comprises a switch (SWIN) for effectively decoupling at least one of said plurality of inputs from the tuner (TUN).
3. A receiver as claimed in Claim 2, characterized in that said tuner (TUN)
- 20 is of the multi-band type for processing the reception signal in one of a plurality of branches (RFI-L ..., RFI-M ..., RFI-H ...) depending on the frequency of the reception signal, and in that said switch (SWIN) is coupled to an input of one (RFI-L ...) of said plurality of branches.
- 25 4. A tuner for receiving reception signals of a first and a second type, the tuner comprising:
 - an input section (TVIN, FMIN, SWIN) for receiving a reception signal;
 - and
 - a mixer-oscillator arrangement (MOIC) for providing, in response to the

reception signal, an intermediate frequency signal (IFS), characterized in that said input section (TVIN, FMIN, SWIN) comprises a plurality of inputs (TVIN, FMIN) to which the reception signal may be applied.

- 5 5. A multimedia apparatus comprising:
a receiver as claimed in Claim 1; and
a control unit (CCU) for controlling said receiver and for processing data
signals.

1/4

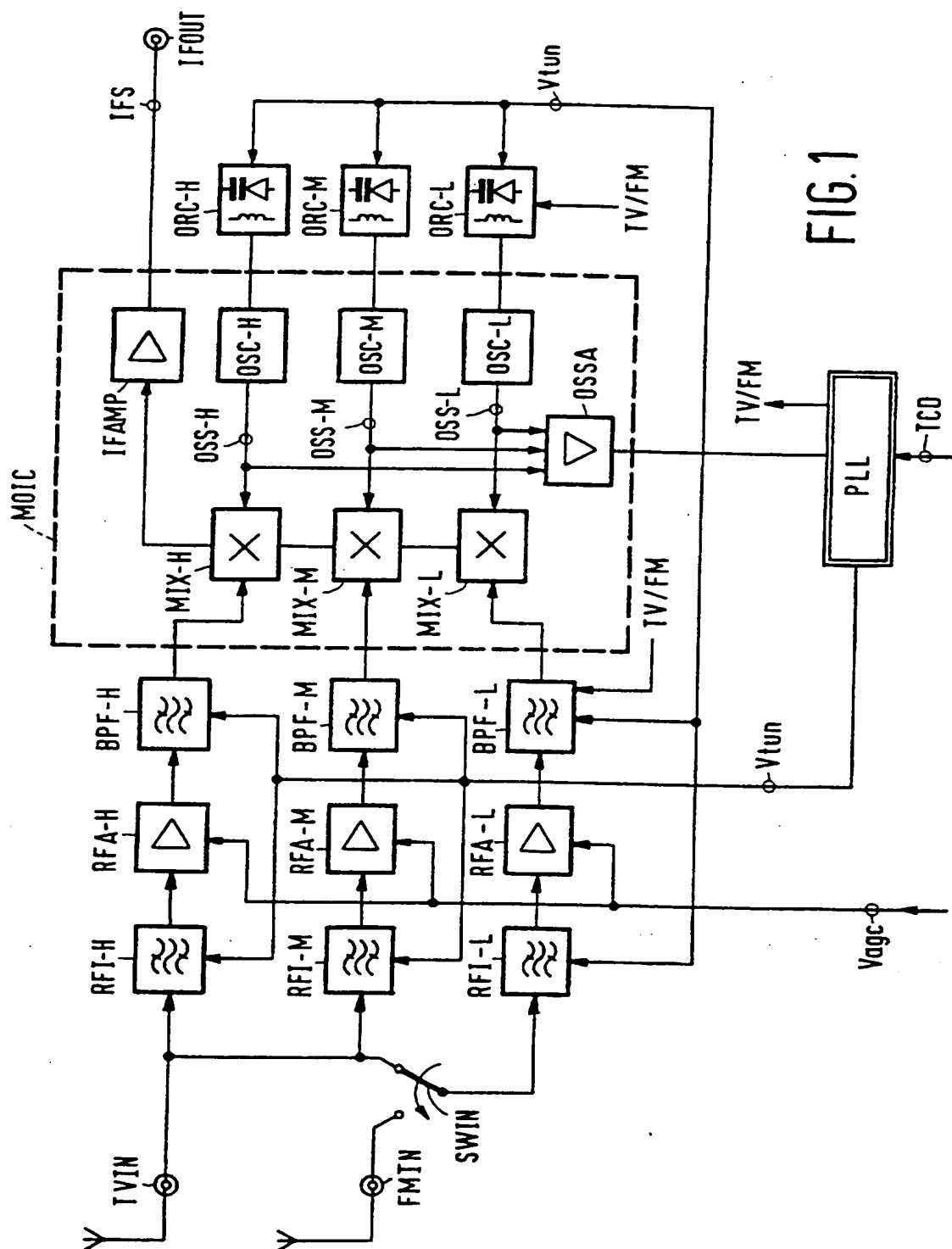


FIG. 1

2/4

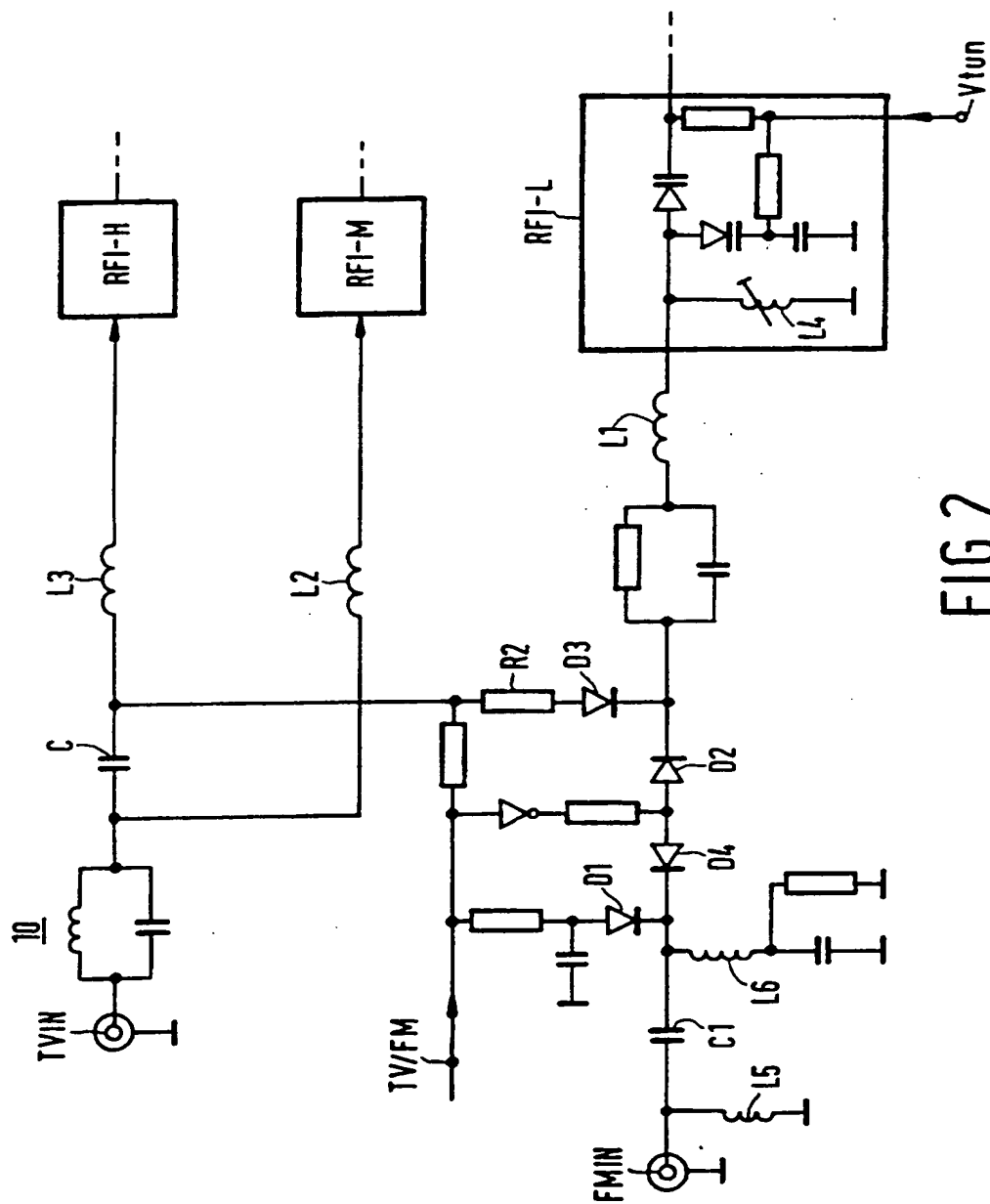
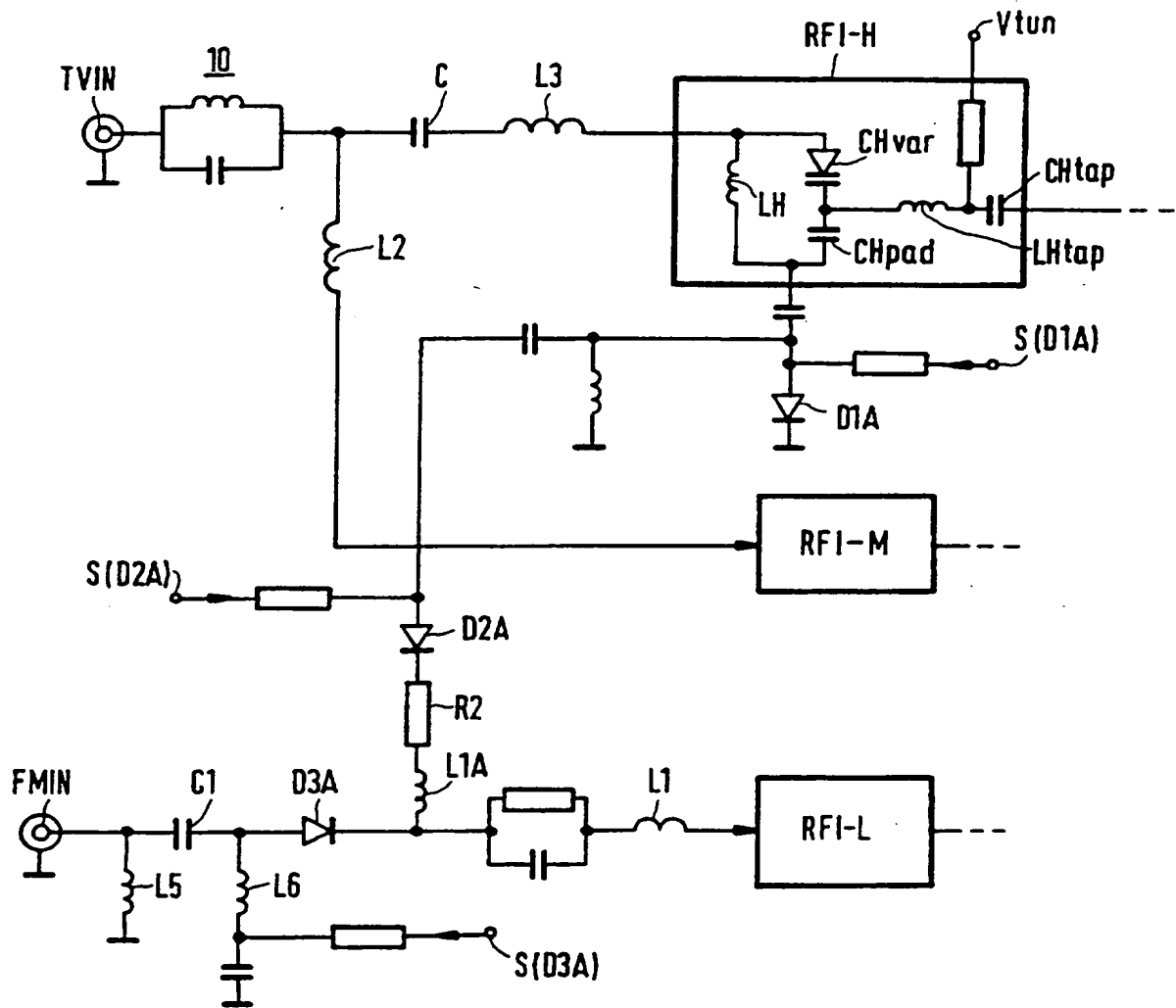


FIG. 2

3/4



4/4

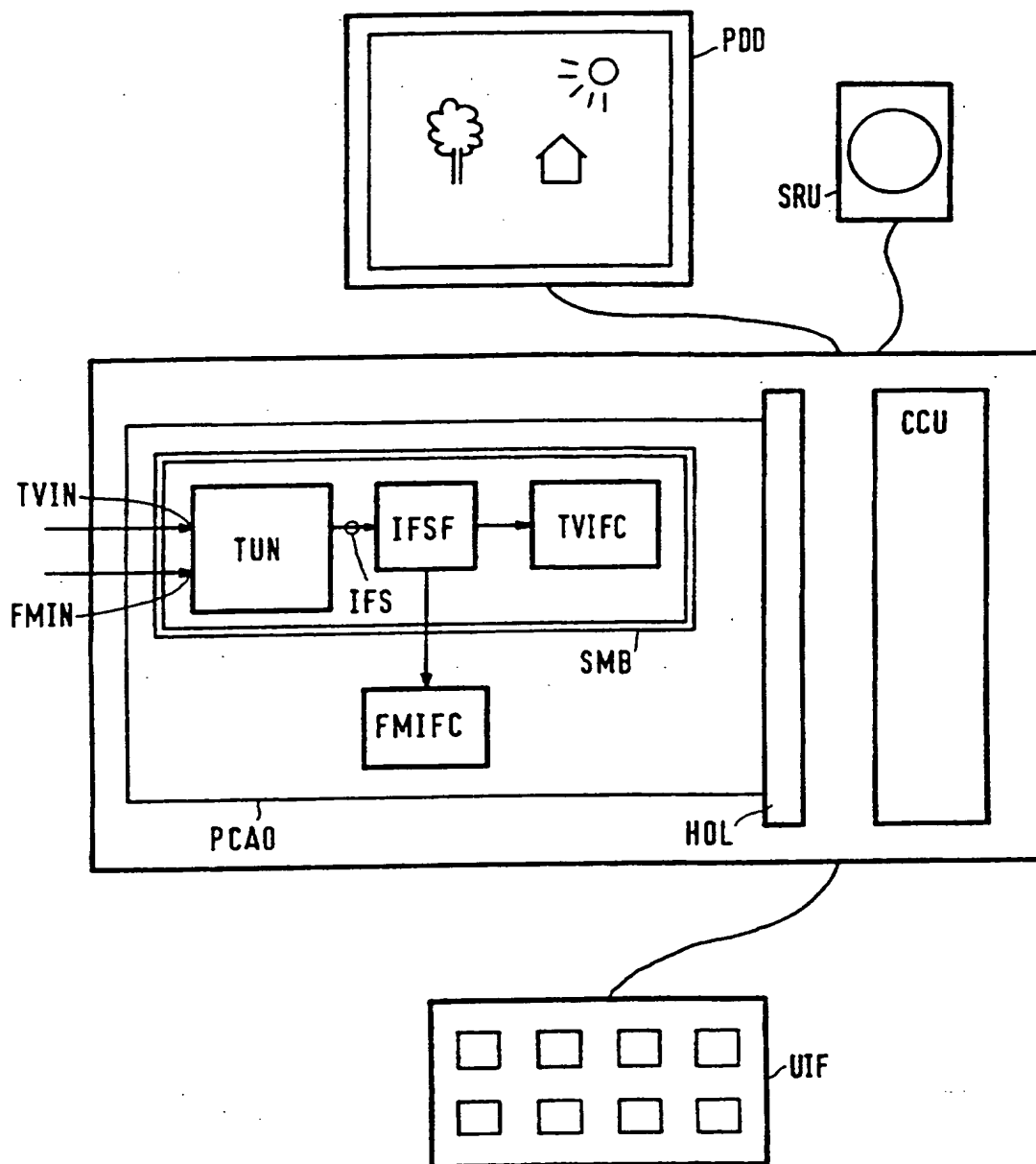


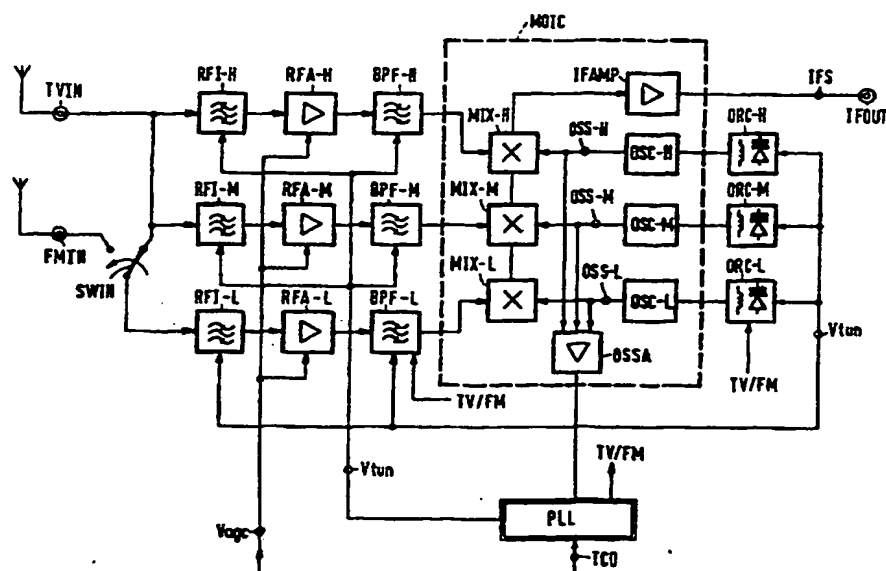
FIG.4



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04N 5/445 // H04N 5/60, H04B 1/26, 1/16	A3	(11) International Publication Number: WO 97/25781 (43) International Publication Date: 17 July 1997 (17.07.97)
(21) International Application Number: PCT/IB96/01412 (22) International Filing Date: 11 December 1996 (11.12.96) (30) Priority Data: 9600124-3 10 January 1996 (10.01.96) SG (71) Applicant: PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). (71) Applicant (for SE only): PHILIPS NORDEN AB [SE/SE]; Kottbygatan 7, Kista, S-164 85 Stockholm (SE). (72) Inventor: BREKELMANS, Johannes, Hubertus, Antonius; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). (74) Agent: KOOIMAN, Josephus, J., A.; Internationaal Octrooibureau B.V., P.O. Box 220, NL-5600 AE Eindhoven (NL).	(81) Designated States: CN, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 12 September 1997 (12.09.97)	

(54) Title: TV/FM RECEIVER FOR MULTIMEDIA APPLICATIONS



(57) Abstract

A receiver for receiving reception signals of a first type, for example TV signals, and reception signals of a second type, for example FM-radio signals, is described. The receiver may be used in multimedia applications. In the receiver, an input section TVIN, FMIN, SWIN comprises at least two inputs TVIN, FMIN to which reception signals can be applied. One input TVIN may, for example, be coupled to a cable network via which reception signals are distributed. The other input FMIN may, for example, be used to plug-in a simple wire antenna. In many cases such a wire antenna will be sufficient to receive on-air reception signals with acceptable quality. The invention takes into consideration that on-air reception signals may not always be offered by the cable network. With at least two inputs TVIN, FMIN, there is flexibility of reception.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 96/01412

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04N 5/445 // H04N 5/60, H04B 1/26, H04B 1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04N, H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4272788 A (MINORU OGITA), 9 June 1981 (09.06.81), column 1, line 7 - line 10; column 4, line 4 - line 16; column 13, line 54 - line 57, figure 3, abstract	1,2
Y	--	3,4,5
X	DE 4302301 A1 (LOEWO OPTA GMBH), 11 August 1994 (11.08.94), claim 1, abstract, see the figure	1,4
X	Patent Abstracts of Japan, Vol 6, No 259, E-149, abstract of JP,A,57-155885 (ZENERARU K.K.), 27 Sept 1982 (27.09.82)	1-4

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 July 1997

Date of mailing of the international search report

24.07.1997

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Michel Gascoin
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 96/01412

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0401932 A1 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN), 12 December 1990 (12.12.90), abstract, see the figure --	1-4
Y	US 4851796 A (JOHANNES H. HENDRIKS), 25 July 1989 (25.07.89), column 1, line 6 - line 11; column 1, line 23 - line 47, see the figure --	3,4
Y	US 4907079 A (LESTER TURNER ET AL), 6 March 1990 (06.03.90), figures 1,4, abstract --	5
A	EP 0493653 A1 (SAMSUNG ELECTRONICS CO., LTD.), 8 July 1992 (08.07.92), see whole document --	1-4
A	EP 0492415 A1 (SAMSUNG ELECTRONICS CO., LTD.), 1 July 1992 (01.07.92), see whole document --	1-5
A	US 5166798 A (SEONG J. CHO,), 24 November 1992 (24.11.92), see whole document --	1-5
X	US 5440351 A (TED ICHINO), 8 August 1995 (08.08.95), figure 2, abstract --	1
X	US 5437051 A (HIDEKI OTO), 25 July 1995 (25.07.95), figure 3, abstract --	2
Y	WO 9221195 A1 (OMNIPOINT CORPORATION), 26 November 1992 (26.11.92), figure 2, claim 6, abstract --	3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 96/01412

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan,, abstract of JP,A, 62-105534 (MATSUSHITA ELECTRIC IND CO LTD), 16 May 1987 (16.05.87) --	1-5
A	US 5483209 A (AKIRA TAKAYAMA), 9 January 1996 (09.01.96), figures 1,4, abstract --	1-5
A	JP 7007683 A (MATSUSHITA ELECTRIC INC CO LTD), 10 January 1995 (10.01.95) --	5
A	Patent Abstracts of Japan,, abstract of JP,A, 5-130557 (NEC HOME ELECTRON LTD), 25 May 1993 (25.05.93) --	5
A	Patent Abstracts of Japan,, abstract of JP,A, 4-70289 (ENU EICHI KEI AITETSUKI K.K.), 5 March 1992 (05.03.92) -- -----	5

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/07/97

International application No.

PCT/IB 96/01412

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	4272788	A	09/06/81	JP 1256979 C	29/03/85
				JP 55055639 A	23/04/80
				JP 59034035 B	20/08/84
DE	4302301	A1	11/08/94	NONE	
EP	0401932	A1	12/12/90	SE 0401932 T3	
				DE 69005905 D,T	30/06/94
				ES 2050352 T	16/05/94
				HK 41796 A	15/03/96
				JP 3064217 A	19/03/91
				NL 8901460 A	02/01/91
				US 5068918 A	26/11/91
US	4851796	A	25/07/89	DE 3875661 A	10/12/92
				EP 0299578 A,B	18/01/89
				JP 1039812 A	10/02/89
				NL 8701641 A	01/02/89
				SG 83094 A	12/05/95
US	4907079	A	06/03/90	NONE	
EP	0493653	A1	08/07/92	NONE	
EP	0492415	A1	01/07/92	SE 0492415 T3	
US	5166798	A	24/11/92	EP 0493653 A	08/07/92
				JP 4277990 A	02/10/92
				JP 7016247 B	22/02/95
US	5440351	A	08/08/95	NONE	
US	5437051	A	25/07/95	JP 5083153 A	02/04/93
WO	9221195	A1	26/11/92	AU 2140092 A	30/12/92
				CA 2102914 A	14/11/92
				EP 0584248 A	02/03/94
				JP 6507768 T	01/09/94
				US 5291516 A	01/03/94
US	5483209	A	09/01/96	JP 5273661 A	22/10/93
JP	7007683	A	10/01/95	NONE	